

Plant metabolic engineering: From the Pharmacy to the Farm

Craig Nessler, Dept. of Plant Pathology, Physiology and Weed Science, Virginia Tech

Vascular plants are literally rooted in their environment and adapt to change by shifting their growth, development, and biochemistry. Plant metabolic engineering seeks to exploit this broad plasticity to increase or decrease the content of specific metabolites in transgenic plants. Our research has focused on engineering pathways for high value pharmaceuticals including opiates (morphine, codeine, and thebaine) and anticancer indole alkaloids (vincristine, vinblastine and camptothecin). We have also shown that transfer of genes encoding early pathway enzymes into heterologous species imparts enhanced resistance to insects suggesting a broader application of this approach to agriculture. The ability of gene transfer technologies to bridge large phylogenetic distances not achievable by traditional breeding offers the opportunity to shuffle natural product pathways and confront plant diseases and pests with new chemistries to which they have not co-evolved.